IAHS2017-381
IAHS Scientific Assembly 2017

Toward continental-scale rainfall monitoring using commercial microwave links from cellular communication networks

Remko Uijlenhoet (1), Hidde Leijnse (2), and Aart Overeem (2)

(1) Wageningen University, Environmental Sciences, Hydrology and Quantitative Water Management, Wageningen, Netherlands (remko.uijlenhoet@wur.nl), (2) R&D Observations and Data Technology, Royal Netherlands Meteorological Institute (KNMI), De Bilt, Netherlands

Accurate and timely surface precipitation measurements are crucial for water resources management, agriculture, weather prediction, climate research, as well as ground validation of satellite-based precipitation estimates. However, the majority of the land surface of the earth lacks such data, and in many parts of the world the density of surface precipitation gauging networks is even rapidly declining. This development can potentially be counteracted by using received signal level data from the enormous number of microwave links used worldwide in commercial cellular communication networks. Along such links, radio signals propagate from a transmitting antenna at one base station to a receiving antenna at another base station. Rain-induced attenuation and, subsequently, path-averaged rainfall intensity can be retrieved from the signal's attenuation between transmitter and receiver. We have previously shown how one such a network can be used to retrieve the space–time dynamics of rainfall for an entire country (The Netherlands, ∼35,500 km2), based on an unprecedented number of links (∼2,400) and a rainfall retrieval algorithm that can be applied in real time. This demonstrated the potential of such networks for real-time rainfall monitoring, in particular in those parts of the world where networks of dedicated ground-based rainfall sensors are often virtually absent. The presentation will focus on the potential for upscaling this technique to continental-scale rainfall monitoring in Europe. In addition, several examples of recent applications of this technique on other continents (South America, Africa, Asia and Australia) will be given.